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Original Paper

# Evaluation of an Easy-to-read Pamphlet on Breastfeeding for Mothers with Intellectual Disabilities

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Key words: easy-to-read pamphlet, intellectual disabilities, breastfeeding, Lättläst manga

Abstract

Despite the small sample size (N=7) limiting generalizability, this study evaluated the perceived utility and potential benefit of an easy-to-read breastfeeding pamphlet, designed using Lättläst (LL) manga principles, for mothers with intellectual disabilities (ID). We employed a mixed-methods design that combined a quasi-experimental pre- and post-test with a cross-sectional survey. This design aimed to assess the pamphlet's impact on breastfeeding knowledge and perceived usability, including readability, comprehensibility, and intention to use. Seven women with ID and 41 healthcare professionals participated. The pamphlet, structured into three sections covering benefits, techniques, and milk expression, was developed in accordance with guidelines for easy-to-read information and LL manga creation. Knowledge improvement was observed after intervention among women with ID, with increases in correct responses noted among participants, particularly those with moderate ID or those without prior breastfeeding. Suggestions for improvements included increasing font size, revising the green color scheme based on feedback regarding visual clarity and affective response, revising the illustration of how to hold the baby, and modifying specific textual expressions. The study demonstrates the potential of tailored educational materials to enhance breastfeeding knowledge in vulnerable populations, highlighting the importance of accessible resources for mothers with ID. Future research should focus on refining the pamphlet based on user feedback, evaluating its long-term impact in real-world clinical settings, and investigating tailored educational approaches for different ID classifications.

## 1. Introduction

Breastfeeding is widely recognized for its benefits in promoting infant growth and development[1,2]. It also strengthens the maternal-infant bond and improves long-term maternal health by reducing risks such as ovarian[3-5] and breast cancers[6-8], type 2 diabetes[9,10], and hypertension[10-13]. According to UNICEF and WHO, the global rate of exclusive breastfeeding for the first six months of life has increased to 48% by 2023, representing a 10-percentage-point rise over the past decade, with a target of 70% set for

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2030[14,15]. Furthermore, postpartum mental disorders have been shown to negatively affect the intention, initiation, and continuation of breastfeeding[16-18]. Conversely, abstaining from breastfeeding or experiencing negative breastfeeding encounters can increase the risk of postpartum depression[19-21], whereas engaging in breastfeeding has been reported to have protective effects against mental disorders[22,23]. Physiological studies indicate that breastfeeding mothers exhibit elevated levels of oxytocin and prolactin, alongside decreased levels of adrenocorticotropic hormone and cortisol, which are associated with reduced anxiety and stress[24]. These hormonal changes may contribute to a decreased incidence of postpartum depression[25-29]. Successful breastfeeding requires appropriate knowledge and skills and can be influenced by infant-specific factors[30]. Consequently, challenges or failures in breastfeeding can themselves become significant stressors for mothers[31]. In particular, inconsistent support and advice from healthcare professionals regarding health concerns and medication safety can confuse mothers and negatively impact their breastfeeding decisions[32]. This inconsistency may also exacerbate perinatal mental health symptoms[32]. People with ID may experience limitations in reasoning, problem-solving, judgment, learning ability, and practical skills, including self-management and daily living skills[33]. Therefore, successful breastfeeding outcomes for these mothers necessitate disability-specific support.

Historically, Japan's approach to individuals with ID has been marked by significant challenges. Until 1996, the Eugenic Protection Law legalized forced sterilization and abortions for people with disabilities or hereditary diseases, aiming to prevent the birth of so-called progeny deemed undesirable. This law effectively prohibited individuals with ID from having children, leading to limited exposure to pregnant women with ID in medical settings. In response to the profound injustices caused by this law, victims filed lawsuits against the Japanese government. The government issued a formal apology in 2017, and in July 2024, the Supreme Court further acknowledged the gravity of the situation by ruling that the provisions of the former Eugenic Protection Law were unconstitutional and recognizing the state's liability for damages. This historical context highlights the relatively recent focus on parental support for individuals with ID in Japan. Consequently, research investigating effective support strategies, such as tailored breastfeeding education, remains crucial.

Sugiura and Fujisawa[34] investigated the perspectives of public health nurses (PHNs) and nurse-midwives (NMWs) on breastfeeding support for mothers with ID. Their findings revealed a disparity in priorities: PHNs emphasized long-term child and maternal well-being through breastfeeding, while NMWs focused on immediate postpartum maternal recovery, prioritizing the reduction of physical and emotional burdens. This discrepancy highlights the need for greater awareness and education among healthcare professionals regarding the various benefits of breastfeeding for both mother and child. Sugiura and Fujisawa[34] attributed the inadequacy of postnatal breastfeeding support to a lack of knowledge and awareness among medical staff. Inspired by these findings and recognizing the critical need for accessible resources to address the identified knowledge gap among both healthcare professionals and mothers with ID, this study aimed to develop and evaluate an easy-to-read breastfeeding pamphlet specifically tailored for this vulnerable population. This intervention sought to empower mothers with ID by providing necessary information for successful breastfeeding.

## 2. Objective

The objective of this study was to evaluate the potential utility of an easy-to-read instructional pamphlet on breastfeeding, designed for mothers with ID, from the perspectives of both women with ID and healthcare professionals.

### *2.1 Research questions*

This study sought to address the following research questions:

(i) Does the educational pamphlet on breastfeeding positively impact the knowledge of women with ID?

(ii) Using descriptive statistics, are there any relevant relationships between pre- and post-pamphlet questionnaire results and participants' demographic variables (level of ID and breastfeeding experience)?

(iii) How do participants with ID perceive the readability of the educational pamphlet? (iv) How do healthcare professionals assess the comprehensibility and readability of the educational pamphlet, and what is their intention for using it? (v) What improvements are needed for the pamphlet?

## 3. Methods

### *3.1 Development of the breastfeeding pamphlet based on Lättläst Manga principles*

Manga, a globally recognized form of visual literature, has gained popularity worldwide. In Japan, educational manga for various age groups, including adults, are commonly published. These publications often employ distinctive stylistic techniques, such as manga symbols (manpu) to convey characters' emotions or states, metaphorical expressions, and layered visual narratives. However, the complexity inherent in manga can pose comprehension challenges for some readers, as Yoshimura[35] noted. This observation led to the conceptualization of 'manga literacy' and the subsequent development of simplified manga, to enhance accessibility for a broader audience, including individuals with ID[35,36].

This study utilized principles from LL manga, an approach emphasizing clear visual communication and simplified narrative structures. This concept, adapted for Japanese manga and deemed appropriate for women with ID who may benefit from visual aids and simplified text, was used to create an accessible, illustrated pamphlet on breastfeeding.

For this study, a 14-page pamphlet on breastfeeding was developed, structured into three distinct sections. The initial three-page section provided information on the benefits of breastfeeding for maternal health and infant development. The second section, comprising six pages, detailed breastfeeding techniques, including feeding timing, maternal and infant positioning, proper latching, and burping techniques. Notably, this section incorporated four-panel LL manga illustrations that contrasted appropriate and inappropriate breastfeeding timing. The third section, consisting of five pages, addressed breast milk expression and storage. This section also included a four-panel LL manga that contrasted proper and improper methods for warming breast milk.

The pamphlet's textual content, illustrations, margins, and layout were designed according to the "Guidelines for Providing Easy-to-read Information to People with ID"[19] and utilized LL manga principles outlined in the "Guidelines for Creating LL Manga"[37]. Specifically, an experienced LL manga artist created the illustrations. The remaining two pages constituted the front and back covers.

### *3.2 Questionnaire*

#### *3.2.1 Questionnaire for participants with ID*

The questionnaire for participants with ID comprised four sections. The initial section collected socio-demographic data, including age, classification of ID certificate, parental status (presence of children), and prior breastfeeding experience. The second section assessed participants' baseline knowledge of breastfeeding prior to exposure to the intervention. This section consisted of 19 questions reflecting the pamphlet contents: five questions on breastfeeding benefits, eight on techniques, three on breast care, one on infant care, and four on milk expression and storage. A "Don't know" option was available for all questions. The third section, administered post-intervention, replicated the questions from the second section to evaluate changes in breastfeeding knowledge following pamphlet exposure. Twelve questions were true/false questions, and the remaining seven questions were multiple-choice questions.

The fourth section explored participants' perceptions of the pamphlet's readability and comprehensibility. Responses were collected using a three-point Likert scale: "good," "average," and "bad." Participants were also prompted to provide open-ended explanations for their ratings.

#### *3.2.2 Questionnaire for healthcare professionals*

The questionnaire for healthcare professionals consisted of two sections. The first section gathered professional background data, including age, profession, and duration of experience supporting parents with ID, measured in months. The second section investigated healthcare professionals' perceptions of the pamphlet's comprehensibility, readability, content structure, and intention to use. Participants

selected responses from a five-point Likert scale: "good," "fairly good," "neutral," "fairly bad," and "bad" for comprehensibility, readability, and content structure; and "likely," "somewhat likely," "neutral," "somewhat unlikely," and "unlikely" for intention to use. Open-ended questions were included to elicit reasons for their evaluations.

*3.3 Research design, participants, and procedure*

The researchers developed two distinct pamphlets for parents with ID: one designed for mothers on breastfeeding, and the other for parents on infant crying and sleeping. These pamphlets were simultaneously evaluated. This paper reports the evaluation of the breastfeeding pamphlet. A concurrent evaluation of a second pamphlet (addressing infant crying and sleeping) was conducted with the same healthcare professional cohort, and those findings are reported separately. This study employed a mixed-methods approach, combining a quasi-experimental single-group pre- and post-test design with a cross-sectional survey.

*3.3.1 Quasi-experimental component (women with ID)*

A one-group pre- and post-test was conducted among women with ID to evaluate the observed impact of the easy-to-read breastfeeding pamphlet. Participants were recruited from two social welfare agencies, meeting inclusion criteria of adult women with moderate to mild ID, as evidenced by a disability certificate. Agency administrators provided organizational consent, and care staff obtained individual informed consent after explaining the study. The process of obtaining informed consent was carefully conducted to avoid any coercion.

Data collection was conducted from November 2023 to January 2024. Participants independently completed a consent checklist and a pre-test questionnaire, reviewed the pamphlet, and then completed the post-test questionnaire. This process was conducted continuously, with a short break of a few minutes interspersed if requested by the participant. Assistance was provided by care staff, including support with reading and comprehension. For participants who explicitly requested further support, staff also acted as scribes to complete the questionnaires based on their verbal responses.

*3.3.2 Cross-sectional survey (healthcare professionals)*

A cross-sectional survey was conducted among healthcare professionals to evaluate the perception and usability of the breastfeeding pamphlet. Participants were recruited from three urban municipalities and one maternity clinic. Administrators provided organizational consent and distributed an anonymous self-administered questionnaire to eligible participants. Participants returned completed questionnaires in sealed individual envelopes, with a return implying consent and explicitly confirmed via a checkbox. Data collection took place between October and December 2023, with administrators distributing materials and participants returning completed questionnaires. This questionnaire included the simultaneous evaluation of two pamphlets, as described in Section 3.3.

*3.4 Data analysis*

Descriptive statistics were used to characterize participants' demographic profiles and describe the frequency, means, and standard deviations of the study variables. For the core analysis, changes in responses between the pre-test and post-test were examined. There were nine possible combinations of pre-test and post-test responses. Patterns of improvement were defined as changes from "incorrect" to "correct" and from "unknown" to "correct." Given the small sample size (N=7), statistical significance testing was not appropriate, and results are presented using descriptive statistics with frequencies and percentages. The limited sample size should be considered when interpreting the results. Additionally, open-ended comments regarding the rationale behind response choices and suggestions for improvement were transcribed verbatim and presented in tabular format.

## 4. Results

*4.1 Demographic characteristics of participants (Table 1)*

*4.1.1 Demographic characteristics of participating women with ID*

The mean age of the participating women with ID was 40.3 years (SD = 11.4), ranging from 28 to 62

years. The age distribution was as follows: one participant in her 20s (14.3%), four in their 30s (57.1%), one in her 40s (14.3%), and one in her 60s (14.3%). Regarding ID classification, four participants (57.1%) were classified as having moderate ID (B1), and three (42.9%) as having mild ID (B2). Among the participants, three had children, and all of them had prior breastfeeding experiences. Specifically, one of the four

Table 1 Demographic characteristics of participants

| | n | (%) |
|---|---|---|
| Participants with ID (N=7) | | |
| Age (years), Mean ± SD (range) | 40.3 ± 11.4 (28-62) | |
| 20s | 1 | (14.3) |
| 30s | 4 | (57.1) |
| 40s | 1 | (14.3) |
| 60s | 1 | (14.3) |
| Classification of ID certificate † | | |
| B1 (Moderate) total | 4 | (57.1) |
| B2 (Mild) total | 3 | (42.9) |
| Parental status | | |
| Yes | 3 | (42.9) |
| No | 4 | (57.1) |
| Past breastfeeding history | | |
| Experienced | 3 | (42.9) |
| Not experienced | 4 | (57.1) |

| | With breastfeeding experience | Without breastfeeding experience |
|---|---|---|
| B1 (Moderate) | 1 | 3 |
| B2 (Mild) | 2 | 1 |

| | | |
|---|---|---|
| Healthcare professionals (N=41) | | |
| Profession | | |
| Public health nurse | 23 | (56.1) |
| Nurse-midwife | 16 | (39.0) |
| Nurse | 1 | (2.4) |
| Obstetrician | 1 | (2.4) |
| IBCLC licenced | 4 | (9.8) |
| Age (years), Mean ± SD (range) | 44.6 ± 10.4 (23-58) | |
| 20s | 4 | (9.8) |
| 30s | 8 | (19.5) |
| 40s | 11 | (26.8) |
| 50s | 18 | (43.9) |
| Experience with ID (months), Mean ± SD (range) | | |
| Overall | 130.5 ± 134.8 (0-390) | |
| Public health nurse | 164.4 ± 141.1 (0-390) | |
| Nurse-midwife, Nurse, Obstetrician | 45.0 ± 54.2 (0-126) | |

ID: intellectual disabilities; SD: standard deviation; IBCLC: International Board of Lactation Consultant

The percentage was calculated based on the total number of participants in each group.

† Classification according to the Japanese 'Ryōiku Techo' certification system

participants with moderate ID (B1) had a child and breastfeeding experience. Conversely, two of the three participants with mild ID (B2) had children and breastfeeding experience.

*4.1.2 Demographic characteristics of participating healthcare professionals*

The mean age of the participants was 44.6 years (SD = 10.4), with a range from 23 to 58 years. The largest age group was participants in their 50s, comprising 18 participants (43.9%). The professional roles of the participants included 23 public health nurses (56.1%), 16 nurse-midwives (39.0%), one registered nurse, and one obstetrician. Among the physicians and midwives, four held the International Board-Certified Lactation Consultant (IBCLC)[†1)] certification. The mean length of experience in caring for individuals with ID was 130.5 ± 134.8 months (range: 0-390 months) for all healthcare professional participants, 164.4 ± 141.1 months (range: 0-390 months) for public health nurses, and 45.0 ± 54.2 months (range: 0-126 months) for midwives, the registered nurse, and the obstetrician.

*4.2 Change between pre-test and post-test answers*

*4.2.1 Frequency of pre-test and post-test response patterns*

Table 2 shows the pre-test and post-test correct response rates for each question, while Table 3 presents the detailed frequencies of the nine possible pre- and post-test response patterns. To assess the apparent

Table 2 Knowledge assessment: Pre-test and post-test correct response rates

(N=7)

| Question category and items | Improvement patterns | | |
|---|---|---|---|
| | Pre-test correct | Post-test correct | Improvement rate † |
| Benefits of breastfeeding | | | |
| 1-1 Breast milk provides all nutrients for first 6 months | 5 (71.4) | 7 (100.0) | 100.0 |
| 1-2 Breastfeeding helps protect babies from illnesses | 5 (71.4) | 7 (100.0) | 100.0 |
| 2-1 Helps mothers return to pre-pregnancy weight | 2 (28.6) | 6 (85.7) | 80.0 |
| 2-2 Reduces risk of osteoporosis | 2 (28.6) | 4 (57.1) | 40.0 |
| 2-3 Reduces risk of breast cancer | 3 (42.9) | 6 (85.7) | 75.0 |
| Breastfeeding techniques | | | |
| 3. When to breastfeed baby | 2 (28.6) | 6 (85.7) | 80.0 |
| 4. Which milk makes baby hungrier faster | 4 (57.1) | 5 (71.4) | 33.3 |
| 5. Correct breastfeeding position | 2 (28.6) | 5 (71.4) | 60.0 |
| 6. Duration of nipple latching | 4 (57.1) | 7 (100.0) | 100.0 |
| 7. Better latch identification | 6 (85.7) | 6 (85.7) | 0.0 |
| Breast care and discomfort | | | |
| 8-1 Pain caused by blood collecting in breast | 3 (42.9) | 5 (71.4) | 50.0 |
| 8-2 Pain caused by milk accumulation | 3 (42.9) | 5 (71.4) | 50.0 |
| 9. Bra type for sore breasts | 5 (71.4) | 7 (100.0) | 100.0 |
| Infant care techniques | | | |
| 10. Correct methods for burping baby | 6 (85.7) | 6 (85.7) | 0.0 |
| Milk expression and storage | | | |
| 11-1 Express when separated from baby | 4 (57.1) | 5 (71.4) | 33.3 |
| 11-2 Express when milk remains after feeding | 5 (71.4) | 7 (100.0) | 100.0 |
| 12-1 Expressing milk by hand | 2 (28.6) | 5 (71.4) | 60.0 |
| 12-2 Expressing milk with a pump | 5 (71.4) | 7 (100.0) | 100.0 |
| 13. Correct methods for warming breast milk | 5 (71.4) | 6 (85.7) | 50.0 |
| Mean correct response rate | 3.9 (55.7) | 5.9 (84.2) | 64.1 |

† Improvement rate calculated as percentage of incorrect/unknown pre-test responses that changed to correct post-test responses

impact of the pamphlet, an analysis of the 'improved' response patterns (i.e., 'unknown-correct' and 'incorrect-correct'), as presented in Table 3, is important. Table 2 summarizes these improvements by showing the pre-test and post-test correct response rates and the corresponding improvement rates.

Specifically, the frequency of 'improved' patterns, excluding the 'correct-correct' pattern, which indicates no change in response, is of significant interest. For six questions (items 1-1, 1-2, 6, 9, 11-2, and 12-2), 100% of participants who answered incorrectly or did not know on the pre-test answered correctly on the post-test. The percentage of participants who demonstrated improvement from pre-test to post-test was 80% for two questions (items 2-1 and 3), and 75% for item 2-3.

Table 3 Response pattern details by question item

(N=7)

| Question category and items | Patterns | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Improvement | | | No change | | Uncertain | | Decline | | Correct-maintaining n(%) |
| | UC | IC | | UU | II | IU | UI | CU | CI | CC |
| Benefits of breastfeeding | | | | | | | | | | |
| 1-1 Breast milk provides all nutrients for first 6 months | 2 | 0 | 2 (100.0) | 0 | 0 | 0 | 0 | 0 | 0 | 5 (71.4) |
| 1-2 Breastfeeding helps protect babies from illnesses | 1 | 1 | 2 (100.0) | 0 | 0 | 0 | 0 | 0 | 0 | 5 (71.4) |
| 2-1 Helps mothers return to pre-pregnancy weight | 2 | 2 | 4 (80.0) | 1 | 0 | 0 | 0 | 0 | 0 | 2 (28.6) |
| 2-2 Reduces risk of osteoporosis | 2 | 0 | 2 (40.0) | 2 | 1 | 0 | 0 | 0 | 0 | 2 (28.6) |
| 2-3 Reduces risk of breast cancer | 2 | 1 | 3 (75.0) | 0 | 1 | 0 | 0 | 0 | 0 | 3 (42.9) |
| Breastfeeding techniques | | | | | | | | | | |
| 3. When to breastfeed baby | 2 | 2 | 4 (80.0) | 1 | 0 | 0 | 0 | 0 | 0 | 2 (28.6) |
| 4. Which milk makes baby hungrier faster | 1 | 0 | 1 (33.3) | 1 | 0 | 0 | 1 | 0 | 0 | 4 (57.1) |
| 5. Correct breastfeeding position | 2 | 1 | 3 (60.0) | 0 | 0 | 0 | 1 | 0 | 1 | 2 (28.6) |
| 6. Duration of nipple latching | 2 | 1 | 3 (100.0) | 0 | 0 | 0 | 0 | 0 | 0 | 4 (57.1) |
| 7. Better latch identification | 0 | 0 | 0 (0.0) | 1 | 0 | 0 | 0 | 0 | 0 | 6 (85.7) |
| Breast care and discomfort | | | | | | | | | | |
| 8-1 Pain caused by blood collecting in breast | 1 | 1 | 2 (50.0) | 1 | 0 | 0 | 1 | 0 | 0 | 3 (42.9) |
| 8-2 Pain caused by milk accumulation | 2 | 0 | 2 (50.0) | 0 | 0 | 0 | 0 | 2 | 0 | 3 (42.9) |
| 9. Bra type for sore breasts | 1 | 1 | 2 (100.0) | 0 | 0 | 0 | 0 | 0 | 0 | 5 (71.4) |
| Infant care techniques | | | | | | | | | | |
| 10. Correct methods for burping baby | 0 | 0 | 0 (0.0) | 1 | 0 | 0 | 0 | 0 | 0 | 6 (85.7) |
| Milk expression and storage | | | | | | | | | | |
| 11-1 Express when separated from baby | 1 | 0 | 1 (33.3) | 0 | 1 | 0 | 0 | 1 | 0 | 4 (57.1) |
| 11-2 Express when milk remains after feeding | 2 | 0 | 2 (100.0) | 0 | 0 | 0 | 0 | 0 | 0 | 5 (71.4) |
| 12-1 Expressing milk by hand | 1 | 2 | 3 (60.0) | 0 | 0 | 0 | 1 | 0 | 1 | 2 (28.6) |
| 12-2 Expressing milk with a pump | 2 | 0 | 2 (100.0) | 0 | 0 | 0 | 0 | 0 | 0 | 5 (71.4) |
| 13. Correct methods for warming breast milk | 1 | 0 | 1 (50.0) | 0 | 0 | 0 | 0 | 0 | 1 | 5 (71.4) |
| Mean frequency | 1.4 | 0.6 | 2.2 (67.3) | 0.4 | 0.2 | 0 | 0.2 | 0.2 | 0.2 | 3.9 (55.7) |
| Total frequency | 27 | 12 | 9 | 8 | 3 | 0 | 4 | 3 | 3 | 73 (55.3) |

† Response pattern codes: CC: Correct-Correct (pre-test correct, post-test correct); UC: Unknown-Correct (pre-test unknown, post-test correct); IC: Incorrect-Correct (pre-test incorrect, post-test correct); UU: Unknown-Unknown (pre-test unknown, post-test unknown); II: Incorrect-Incorrect (pre-test incorrect, post-test incorrect); IU: Incorrect-Unknown (pre-test incorrect, post-test unknown); UI: Unknown-Incorrect (pre-test unknown, post-test incorrect); CU: Correct-Unknown (pre-test correct, post-test unknown); CI: Correct-Incorrect (pre-test correct, post-test incorrect)

*4.2.2 Change in pre-post answer patterns by demographic variables*

*(1) Comparison of response patterns by breastfeeding experience (Table 4)*

In the pre-test, participants with breastfeeding experience demonstrated 100% correct responses for nine items (1-1, 1-2, 6, 7, 9, 10, 11-2, 12-2 and 13). Despite this, one participant answered incorrectly for item 13 in the post-test. Following the intervention with the pamphlet, three additional items (2-1, 5, and 12-1) reached complete accuracy. Participants without breastfeeding experience did not achieve 100% correct responses in the pre-test. However, in the post-test, nine items (1-1, 1-2, 2-1, 3, 6, 9, 11-2, 12-2, and 13) reached full marks, and item six items (4, 7, 8-1, 8-2, 10, and 11-1) also demonstrated a high correct response rate of 75%. Notably, seven items (1-1, 1-2, 2-1, 6, 9, 11-2, and 12-2) achieved 100% correct responses in the post-test for both groups. The percentage of 'improved' response patterns reaching 100% was observed for three items (2-1, 5, and 12-1) in the breastfeeding experience group.

*(2) Comparison of response patterns by ID certificate type (Table 5)*

In the mild ID group, 100% accuracy was observed both before and after the reading intervention for seven items (1-1, 1-2, 6, 7, 9, 10, and 11-1). In the post test, six items (2-1, 3, 4, 5, 8-1, and 8-2) improved to

Table 4 Comparison of correct response rates by breastfeeding experience

n(%) (N=7)

| | With experience (n=3) | | Without experience (n=4) | |
|---|---|---|---|---|
| Question category and items | Pre-test | Post-test | Pre-test | Post-test |
| Benefits of breastfeeding | | | | |
| 1-1 Breast milk provides all nutrients for first 6 months | 3(100.0) | 3(100.0) | 2(50.0) | 4(100.0)* |
| 1-2 Breastfeeding helps protect babies from illnesses | 3(100.0) | 3(100.0) | 2(50.0) | 4(100.0)* |
| 2-1 Helps mothers return to pre-pregnancy weight | 1(33.3) | 3(100.0) | 1(25.0) | 4(100.0)* |
| 2-2 Reduces risk of osteoporosis | 2(66.7) | 2(66.7) | 0(0.0) | 2(50.0) |
| 2-3 Reduces risk of breast cancer | 1(33.3) | 2(66.7) | 2(50.0) | 2(50.0) |
| Breastfeeding techniques | | | | |
| 3. When to breastfeed baby | 2(66.7) | 2(66.7) | 0(0.0) | 4(100.0)* |
| 4. Which milk makes baby hungrier faster | 2(66.7) | 2(66.7) | 2(50.0) | 3(75.0) |
| 5. Correct breastfeeding position | 2(66.7) | 3(100.0)* | 0(0.0) | 2(50.0) |
| 6. Duration of nipple latching | 3(100.0) | 3(100.0) | 1(25.0) | 4(100.0)* |
| 7. Better latch identification | 3(100.0) | 3(100.0) | 3(75.0) | 3(75.0) |
| Breast care and discomfort | | | | |
| 8-1 Pain caused by blood collecting in breast | 0(0.0) | 2(66.7) | 3(75.0) | 3(75.0) |
| 8-2 Pain caused by milk accumulation | 2(66.7) | 2(66.7) | 3(75.0) | 3(75.0) |
| 9. Bra type for sore breasts | 3(100.0) | 3(100.0) | 2(50.0) | 4(100.0)* |
| Infant care techniques | | | | |
| 10. Correct methods for burping baby | 3(100.0) | 3(100.0) | 3(75.0) | 3(75.0) |
| Milk expression and storage | | | | |
| 11-1 Express when separated from baby | 2(66.7) | 2(66.7) | 2(50.0) | 3(75.0) |
| 11-2 Express when milk remains after feeding | 3(100.0) | 3(100.0) | 2(50.0) | 4(100.0)* |
| 12-1 Expressing milk by hand | 2(66.7) | 3(100.0)* | 0(0.0) | 2(50.0) |
| 12-2 Expressing milk with a pump | 3(100.0) | 3(100.0) | 2(50.0) | 4(100.0)* |
| 13. Correct methods for warming breast milk | 3(100.0) | 2(66.7) | 2(50.0) | 4(100.0)* |
| Mean correct response rate | 2.3(75.4) | 2.6(86.0) | 1.6(40.8) | 3.3(82.9) |

ID: intellectual disabilities

* Items where all participants who answered incorrectly or "don't know" in pre-test answered correctly in post-test (100% improvement rate)

66.7%, while one item (11-2) reached 100%. In the moderate ID group, no items achieved 100% accuracy in both the pre-test and post-test. However, ten items (1-1, 1-2, 2-1, 2-3, 3, 6, 9, 11-2, 12-2, and 13) reached 100% accuracy after reading the educational pamphlet.

*4.2.3 Readability evaluation and reasons provided by participants with ID*

Table 6 presents the readability evaluation and the reasons provided by participants with ID. The proportion of "good" ratings was 85.7% for illustrations, 71.4% for manga, and 57.1% for texts. Participants who rated the text as "bad" cited the need for a larger font size and shorter sentences. The participant who rated the manga as "average" indicated a need for improved clarity as the reason for their evaluation. Overall feedback revealed concerns regarding the complexity of the content and dissatisfaction with the base color.

*4.2.4 Evaluation of comprehensibility, readability, and intention to use by participating healthcare professionals (Table 7)*

For comprehensibility, 87.8% of respondents gave positive ratings (combining "good" and "fairly good" responses), with 48.8% rating it as "good" and 39.0% as "fairly good". For readability, 43.9% of respondents

Table 5 Comparison of correct response rates by ID certificate type

n(%) (N=7)

| | B1 (Moderate) (n=4) | | B2 (Mild) (n=3) | |
|---|---|---|---|---|
| Question category and items | Pre-test | Post-test | Pre-test | Post-test |
| Benefits of breastfeeding | | | | |
| 1-1 Breast milk provides all nutrients for first 6 months | 2(50.0) | 4(100.0)* | 3(100.0) | 3(100.0) |
| 1-2 Breastfeeding helps protect babies from illnesses | 2(50.0) | 4(100.0)* | 3(100.0) | 3(100.0) |
| 2-1 Helps mothers return to pre-pregnancy weight | 2(50.0) | 4(100.0)* | 0(0.0) | 2(66.7) |
| 2-2 Reduces risk of osteoporosis | 1(25.0) | 3(75.0) | 1(33.3) | 1(33.3) |
| 2-3 Reduces risk of breast cancer | 1(25.0) | 4(100.0)* | 2(66.7) | 2(66.7) |
| Breastfeeding techniques | | | | |
| 3. When to breastfeed baby | 1(25.0) | 4(100.0)* | 1(33.3) | 2(66.7) |
| 4. Which milk makes baby hungrier faster | 3(75.0) | 3(75.0) | 1(33.3) | 2(66.7) |
| 5. Correct breastfeeding position | 1(25.0) | 3(75.0) | 1(33.3) | 2(66.7) |
| 6. Duration of nipple latching | 1(25.0) | 4(100.0)* | 3(100.0) | 3(100.0) |
| 7. Better latch identification | 3(75.0) | 3(75.0) | 3(100.0) | 3(100.0) |
| Breast care and discomfort | | | | |
| 8-1 Pain caused by blood collecting in breast | 2(50.0) | 3(75.0) | 1(33.3) | 2(66.7) |
| 8-2 Pain caused by milk accumulation | 2(50.0) | 3(75.0) | 1(33.3) | 2(66.7) |
| 9. Bra type for sore breasts | 2(50.0) | 4(100.0)* | 3(100.0) | 3(100.0) |
| Infant care techniques | | | | |
| 10. Correct methods for burping baby | 3(75.0) | 3(75.0) | 3(100.0) | 3(100.0) |
| Milk expression and storage | | | | |
| 11-1 Express when separated from baby | 1(25.0) | 2(50.0) | 3(100.0) | 3(100.0) |
| 11-2 Express when milk remains after feeding | 2(50.0) | 4(100.0)* | 3(100.0) | 3(100.0) |
| 12-1 Expressing milk by hand | 0(0.0) | 2(50.0) | 2(66.7) | 3(100.0)* |
| 12-2 Expressing milk with a pump | 3(75.0) | 4(100.0)* | 2(66.7) | 2(66.7) |
| 13. Correct methods for warming breast milk | 3(75.0) | 4(100.0)* | 2(66.7) | 2(66.7) |
| Mean correct response rate | 1.8(46.1) | 3.4(85.5) | 2.0(66.7) | 2.5(82.5) |

ID: intellectual disabilities

* Items where all participants who answered incorrectly or "don't know" in pre-test answered correctly in post-test (100% improvement rate)

Table 6 Readability evaluation by participants with ID

(N=7)

| Evaluation | Good n(%) | Average n(%) | Bad n(%) |
|---|---|---|---|
| Illustrations | 6 (85.7) | 0 ( 0.0) | 1 (14.3) |
| Text | 4 (57.1) | 1 (14.3) | 2 (28.6) |
| Manga | 5 (71.4) | 1 (14.3) | 1 (14.3) |
| Representative comments by evaluation aspect and rating: | | | |
| Illustrations | | | |
| Good | • "Illustrations provided clear explanations" | | |
| | • "Very good quality illustrations" | | |
| | • "Easy to understand" | | |
| Bad | • "Difficult to see due to background color" | | |
| Text | | | |
| Good | • "Written in appropriately large letters" | | |
| | • "Careful explanations were provided" | | |
| Average | • "Text size was neither too big nor too small" | | |
| Bad | • "Font size is too small" | | |
| | • "Sentences are too long" | | |
| Manga | | | |
| Good | • "Depicted situations appropriately" | | |
| | • "High quality manga" | | |
| | • "Easy to understand" | | |
| Average | • "I want it to be a little easier to understand" | | |
| Bad | • "No specific comments provided" | | |
| Overall feedback from participants: | | | |
| • "The light green background made it hard to see" | | | |
| • "A little difficult to understand" | | | |
| • "I wouldn't have understood without my supporters" | | | |
| • "It doesn't make sense to me" | | | |

ID: intellectual disabilities

rated it as "good" and another 43.9% rated it as "fairly good". Overall, 87.8% of respondents gave positive ratings for both comprehensibility and readability. Regarding content structure, 95.1% (31.7% "good" and 63.4% "fairly good") of healthcare professionals provided positive ratings. In terms of intention to use, 53.7% of respondents were "likely", 31.7% were "somewhat likely", and 14.6% were "neutral". Notably, no respondents indicated "somewhat unlikely" or "unlikely." Overall, 85.4% of respondents expressed positive intention to use the pamphlet (combining "likely" and "somewhat likely" responses). Suggestions for improvement included changing the primary color from green to an alternative shade, revising the illustration of how to hold the baby, and modifying certain textual phrases.

## 5. Discussion

A primary limitation of this study is the exceptionally small sample size (N=7) of mothers with ID who participated in the pre/post-test evaluation. This significantly restricts the generalizability of our findings. Crucially, the quantitative pre/post-test results obtained from this small sample should therefore be interpreted with caution and cannot be broadly generalized to the wider population of mothers with

Table 7 Healthcare professionals' evaluation of the breastfeeding pamphlet

(N=41)

| Evaluation | Positive† n(%) | Neutral††† n(%) | Negative†† n(%) |
|---|---|---|---|
| Comprehensibility | 36 (87.8) | 3 (7.3) | 2 (4.9) |
| Readability | 36 (87.8) | 4 (9.8) | 1 (2.4) |
| Content structure | 39 (95.1) | 1 (2.4) | 1 (2.4) |
| Intention to use | 35 (85.4) | 6 (14.6) | 0 (0.0) |
| Representative comments by evaluation aspect: | | | |
| Comprehensibility: | | | |
| Positive: | • "Illustrations and explanatory text are easy to read and understand" | | |
| | • "Ruby characters and many illustrations are used effectively" | | |
| Neutral: | • "Unsure to what degree of ID it is intended for" | | |
| | • "A more straightforward explanation would seem easier to convey" | | |
| Negative: | • "Too many characters" | | |
| | • "Text alignment makes it difficult to read as the eye moves" | | |
| Readability: | | | |
| Positive: | • "The illustrations are large and engaging" | | |
| | • "Illustrations alone can easily convey the message" | | |
| | • "The text does not contain too many characters" | | |
| Neutral: | • "Due to the all-green design, the message is hard to understand" | | |
| Negative: | • "The excessive use of green gives it a dark feel, hindering reading enjoyment" | | |
| Content structure: | | | |
| Positive: | • "Everything you need to know is explained in simple terms" | | |
| | • "Well-organized information flow" | | |
| Neutral: | • "In the 'Interval between feedings' column, consider omitting '1 hour later'" | | |
| Negative: | • "Unclear about the specific level of intellectual disability targeted" | | |
| Intention to use: | | | |
| Positive: | • "The simple wording is universally understandable" | | |
| | • "Valuable resource for teaching as a supporter" | | |
| | • "Can be utilized by all pregnant and postpartum women" | | |
| Neutral: | • "While the information was crucial, it was rather excessive" | | |
| Negative: | • No negative comments provided | | |
| Key suggestions for improvement: | | | |
| Design aspects: | | | |
| • "The colors in the brochure give a dark and cold impression | | | |
| • "Ensure consistent and sufficient contrast between text and background" | | | |
| • "Consider using a warmer, more inviting color scheme instead of all-green" | | | |
| Content clarity: | | | |
| • "Supporting the head as depicted in the armpit hugging illustration (page 7) may lead to wrist tendonitis" | | | |
| • "Revise illustrations to demonstrate ergonomically sound techniques" | | | |
| • "Use phrases like 'it's better to do this' rather than negative expressions like '...is no good'" | | | |
| Potential misunderstandings: | | | |
| • "The expression 'one hour after the last feeding' in the nursing interval column (page 5) may be misinterpreted as meaning breast milk must be fed every hour" | | | |
| • "Clarify feeding interval guidance to prevent confusion" | | | |
| • "Provide clear examples of typical feeding patterns" | | | |
| ID: intellectual disabilities | | | |

† Positive: Combined "Good" and "Fairly good" responses for comprehensibility, readability, and content structure; Combined "Likely" and "Somewhat likely" responses for intention to use

†† Negative: Combined "Fairly bad" and "Bad" responses for comprehensibility, readability, and content structure; Combined "Somewhat unlikely" and "Unlikely" responses for intention to use

††† Neutral: "Neutral" responses for all categories

ID. Nevertheless, despite this limitation, the observed positive trends in breastfeeding knowledge among the participants with ID imply that the easy-to-read pamphlet holds promise and potential as a valuable educational resource for this population, particularly when used in conjunction with support from healthcare professionals.

Among the seven women with ID who participated, three had children and prior breastfeeding experience (one with moderate ID and two with mild ID). The precise number of parents with ID in Japan remains unknown due to several factors. These include the variability in ID certification processes across prefectures, which leads to slight differences in assessment indicators and criteria[38]. Additionally, it is often reported that ID or borderline intellectual functioning is frequently identified during pregnancy, childbirth, or childcare[39], a trend also observed in Japan. Given that nulliparous women typically learn breastfeeding without prior childcare experience, the inclusion of the four participants without prior breastfeeding experience (three with moderate ID and one with mild ID) among the seven participants reflects clinical realities. Participants included healthcare professionals, predominantly public health nurses employed by local municipalities and midwives from obstetric clinics with a focus on breastfeeding support. This selection facilitated a comprehensive assessment of the pamphlet's utility, incorporating insights from professionals with expertise in supporting mothers with ID and those specializing in breastfeeding guidance.

Notably, the increased post-test correct response rates in the group without breastfeeding experience and among women with moderate ID suggest the potential benefit of using the pamphlet for first-time mothers with ID. While the material appeared beneficial in improving knowledge in several areas, some items showed no improvement in correct answer rates. This points to the need that further refinement of these sections may be necessary. Although no guidance was provided by support personnel during the current survey, the pamphlet is intended for use as a teaching tool in clinical settings when healthcare professionals provide verbal explanations. For items that did not show improvement, it is expected that explanations incorporating the mother's actual responses will lead to better understanding. The positive evaluations of readability and comprehensibility by both women with ID and healthcare professionals highlight the pamphlet's usability and accessibility. The high proportion of "good" and "fairly good" ratings, along with the expressed willingness of healthcare professionals to use the pamphlet, points to its potential for practical application. However, despite the generally positive feedback, user input also pinpointed specific areas for improvement to enhance the pamphlet's usability and comprehensibility. Suggestions from participants with ID included the need for a larger font size and shorter sentences, while both groups commented on the visual clarity and affective response related to the green color scheme. Healthcare professionals additionally recommended revisions to the illustration depicting infant positioning and adjustments to specific phrasing to prevent potential misunderstandings. These insights will directly inform the next iteration of the pamphlet. This suggests that while the pamphlet showed potential, its optimal use may be as a pedagogical aid during direct instruction by healthcare professionals, rather than solely as a self-study resource, especially to address comprehension difficulties observed for items showing less improvement in the pre/post-test and to clarify points raised in the feedback. It is imperative for healthcare professionals to recognize that a significant proportion of parents with ID exhibit mild or borderline cognitive functioning[39]. This understanding suggests that while the pamphlet showed potential, its optimal use would be as a pedagogical aid during direct instruction by healthcare professionals, rather than solely as a self-study resource. This interactive approach could address comprehension difficulties observed for items showing less improvement in the pre/post-test.

## 6. Outlook

Addressing clinical challenges, this study developed an easy-to read educational resource for mothers with ID. Future research will prioritize expanding resources to facilitate effective parenting support while also promoting equal access to parenthood.

## 7. Limitations

This study has several limitations that impact the interpretation of its findings. The use of convenience sampling restricts generalizability. The small number of participants with ID (n=7) may not fully represent the population. Assistance from familiar care staff was provided to participants with ID during the surveys upon request for aspects other than answering the questions themselves. However, the presence of staff might have introduced some tension or affected participants' concentration, potentially influencing the results.

## 8. Conclusion

Despite the limitations of the small sample size, this study provides preliminary evidence of the potential for a specifically designed breastfeeding pamphlet to improve knowledge among women with ID. Further research with larger samples is needed to confirm these findings. The observed improvements in knowledge, coupled with positive evaluations from both participants and healthcare professionals, highlight the pamphlet's potential utility and usability. Future research should focus on further refining the pamphlet[†2)] based on user feedback and evaluating its long-term impact in real-world clinical settings.

## Ethical considerations

This study received ethical approval from the research ethics committee of Nagoya Women's University (approval no. 2022-12) and the research ethics review committee of Seinan Jo Gakuin University (approval no. 2023-2). Participants were provided with written information detailing the study's purpose, methodology, potential benefits and risks of participation, protection of personal information, voluntary nature of participation, disclosure of research findings, publication of research results, and data storage. Informed consent was obtained through the completion of a consent checklist by participants with ID. For healthcare professionals, consent was implied by the return of completed questionnaires and explicitly confirmed via a checkbox. For participants with ID, requests were made to the administrators and care staff of the welfare facilities, acting as intermediaries, to ensure that participation was not coerced.

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## Conflict of interest

The authors declare no conflict of interest.

## Notes

†1) IBCLC: International Board of Lactation Consultants. Healthcare professionals with the necessary skills, knowledge and attitude to provide support for successful breastfeeding.

†2) The latest version of the pamphlet can be downloaded directly here: https://researchmap.jp/read0123877/published_works

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